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ON THE VICARIOUS FUNCTION OF THE CEREBRAL HEMISPHERES AND CONVOLUTIONS, CONSIDERED IN RELATION TO UNILATERAL WOUNDS OF THE HEAD AND INSANITY.

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Among the insane, the delusion of double personality is much less common than the loss of self identity, and the delusion of metamorphosis into some other person, or possession by some spiritual or superhuman influence or power. The lunatic often imagines himself transformed into God, angel, devil, or into some earthly hero, potentate, sage, or other character, but seldom fancies himself more than one of these characters at once. He generally has a name and a mission; as Christ he is the "Savior of the World" and the "Prince of Peace," as the Archangel Gabriel, he leads the angelic hosts, and ministers comfort and sympathy to his fellow patients, whom he is usually consistent enough to imagine, when in the height of his delusional exaltation, to be winged denizens of heaven, or in the name of his satanic majesty, he is full of suggestions of evil, making mischief in an infinite variety of ways, and "raising the devil," as the attendants sometimes say "in the hospital."

In the character of a Wellington, a Napoleon, or a Socrates, he passes his time in re-enacting imaginary history; unconsciously to him, time is rolled backward in its flight, and amid the scenes of other days, before ever he was brought forth, he enacts in *propria persona* these or other similar characters, long passed from life's stage.

Singularly inconsistent, the millionaire, monarch, by reason of his money, "of all he surveys," blandly begs a chew of tobacco instead of commanding some one among his retinue of servants to procure him the desired narcotic, and the Savior of the World, who but a moment before has asserted that he compassionately died for your sins, joins the man of money in soliciting a "bit of the weed," and forgetting his fancied divinity, lustily damns you after the manner of the most profane of mortals, for your polite refusal to violate the rule of the hospital. The "Iron Duke" and the "Little Corporal" forget the haughty demeanor which they assume as characteristic of these great personages and condescendingly fraternize for a small personal favor, or coveted trinket, and the philosophic and sedate husband of Xantippe, will demonstrate the truth that,

> "A little nonsense now and then
> Is relished by the wisest men,"

in a lunatic asylum as well as in the world without, which denominates itself wholly *compos mentis.*

You may see devil and duke, heathen sage and christian philosopher, seated around a common table, quietly engaged, like ordinary mortals, or rather more quietly than ordinary mortals, in common games of cards, dominoes, checkers, &c., and the poet, who in his insanest transport despises filthy lucre, or the warrior ceasing "for the nonce to fight his battles o'er," stoop to take a hand and conquer, if possible, in the same game, or to bet imaginary ducats, dubloons or greenbacks on their favorite player, deciding sometimes whom to venture their money on, after ascertaining the one who beats. But with all the inconsistencies and vagaries which usually characterize the insane, who possess delusions, the rarest of all is for the patient to regard himself as two distinct persons at one and the same time. An in-

teresting case of this kind was reported by Dr. Joffe, to the Society for Psychiatry and forensic Psychology in Vienna, in 1870, and appears in the *Journal of Psychological Medicine*, for July of same year, occupying much more space than we here give it. He was a married man, aged 53, healthy in childhood and youth, in manhood had headache and giddiness, was a soldier fourteen years; in encounters with smugglers, received several cuts in the head. His temper was irrascible, he was fond of drink, had hæmorrhoids and constipation for ten years. Disposition serious. His memory failing, he became unfit for service and was discharged in 1861. His pecuniary circumstances caused him great anxiety, and in the same year, (1861,) he exhibited unmistakable signs of mental disturbance. He continually employed the expression "we"—"we will go,"—"we will run,"—"we will do it," etc. The "other" man pulled his ear, plucked his arm, etc. His left arm had spasmodic twitchings. He invited himself to dine with his sister, saying that the "other man" compelled him to be her guest. While eating he said, "I have eaten enough, but the other has not." After the meal he ran out of the house, when arrested, said "the other" was to blame, he was doing what he could to make him stop. Tried to murder a child, assigning a similar cause for the attempt. He rolled into the gutter, thinking he was wrestling with "the other," and finally attempted to commit suicide, imagining he was killing "the other." This brought him to the hospital. The conformation of head was normal, pupils contracted unequally, re-action to light in both limited. Hearing normal, but saw small animals, insects, etc., with left eye, and vision dim in right eye. Tearing pains in left ear and side of face. Physiognomy anxious and expression of suffering. Skin dry

and temperature, and sensibility of body natural. Pulse seventy-eight. Reflex movement to tickling soles of feet prompt. No digestive trouble.

The "other" person was in his left side, under his skin. He called himself the right D—— (D—— was his name,) the left D—— was a rascal and caused all his misfortunes. He sometimes presented the picture of anxiety, dripping with sweat, and holding fast his shirt with both hands, in order as he said, to make himself stop. He had violent impulses to motion, lasting an hour or two, occurring several times in the course of six weeks, which were probably epileptic or epileptoid seizures. After conversing sometime, long enough probably to weary and morbidly disturb the sound hemisphere, his ideas grew confused, and it was impossible to gather any sense from what he said.

He died of dysentery, and during the progress of the disease had no apparent delusions. "The autopsy revealed a thickened dura mater. On the left side of the falx, there was a lamina of bone half an inch long and a quarter of an inch broad. Inner coats of the brain along the course of the vessels were opaque, infiltrated with serum; their veins quite full. Convolutions of the anterior lobes, especially the left lobe, very much thinned on the convexity—*left anterior lobe*, half an inch shorter than the right. Anterior half of ventricle of this side was adherent and hard. Optic thalamus and corpus striatum atrophied—especially the latter. Brain moist, anæmic, tough. Ependyma of the lateral ventricles thickened and granulated, corresponding to the thinned convolutions of the anterior lobe. The cortex was thinned, and the adjacent medulla was indurated to the touch."

Dr. Joffe conjectured that "the striking difference in the condition of the two hemispheres was doubtless a

chief cause in the production of this delusion." But such an explanation does not amount to conclusive demonstration, in view of the now pretty conclusively established fact, that "the mental faculties have been known to be unaffected, where one of the hemispheres was considerably atrophied,"* and otherwise diseased, a single hemisphere sufficing for the intellectual operations. The mind in such cases, not acting insanely, but only with less vigor, and sooner becoming wearied. The mental force of a single hemisphere is the same in kind, as the force developed by the two lobes of the cerebrum.

The fact, however, that one part of this dual lunatic, (the right D——) was always right, and the left D—— the side of the most diseased was always the source of trouble, would seem to add confirmation to the supposition that the hemispheres perform a vicarious function, as we have seen in the cases of injury to one side of the head, as in the case of P. P. Gage, related by Dr. Harlow, of Maine, about twenty years ago, and other similar cases, collected and reported in our standard works on Surgery.

Wigan asserted the duality of the mind in 1844, and Holland and Brown-Sequard and others have since maintained that the brain was a double organ. Griesinger conjectured, that "in the normal state the two hemispheres acted by turns, or that the mental effort is divided between them."

We do not naturally think double, as Wigan maintained, because we have two hemispheres to the brain, any more than we habitually see double, because we have two eyes or hear double, because we have two ears, or breath double, because we have two lungs.

Griesinger mentions a "case of melancholia with ideas of persecution and attempts at suicide, when the

* Greisinger, Cruvilhier and others.

individual was conscious of the fact and declared that he was insane only on one side of the head."

I had under treatment a patient, I. P. M., still in the Asylum at Fulton, Mo., who, in the early stage of his disorder, before he had passed into a condition resembling dementia, insisted that he had two brains, which were the seat of intellection; that one of them, his anterior brain, as he called it, was continually urging him to do evil, (Wigan's idea, though he never read this author,) and that it was all the other brain could do to restrain him from yielding to the control of the bad organ; in fact the bad organ got the better of him, to such an extent at one time, that he attempted to injure the writer with a scrub-brush. He complained of of frontal headache a good deal, and was addicted to constant masturbation. His insanity was the result of irregular life, exposure and typhoid fever during the war, and perhaps masturbation, but of this I am not certain, as this vice is often the result, as well as the cause of insanity. At times he would talk rationally and lamentingly of his misfortune in thus being subjected to a dual government of his head, as a sane man would of any physical misfortune *ex capitis*. He finally became quiet, indifferent about his evil brain as well as his person and surroundings, and lapsed into a state of dementia. The headache of which he complained was rather an uneasy sensation in one of the anterior cerebral lobes, and he asked me several times if I could not operate upon him and relieve him. He never had any cranial injury. He was not very clear as to how he came in possession of a good and evil mind and a brain for each, two distinct mental organs with antagonizing functions. He was conscious of the fact and we could not persuade him that a part of his brain was probably diseased. We reasoned against

conscious impression, and it is as futile to attempt to reason an insane, as a sane man, out of the attestations of consciousness. To both the sane and the insane, these are often higher law than the conclusions of logic, resting upon the same basis in the mind as the evidence of the senses. Delusions are the false attestations of a consciousness disordered by disease. There was nothing perceptibly abnormal about the patient, except his mentality, and a general sluggishness in the performance of all his physical functions, and this fact saves us and you the infliction of a tedious detail of morbid physical minutiæ. He was twenty-five years of age and unmarried.

Insanity, whether its manifestations are single, dual or multifarious, is due to structural lesion or other morbid involvement of the free surfaces, possibly also of the ventricles* of the brain, (though I doubt whether any mentality resides on the ventricular walls) and generally, so far as post mortem demonstrations enlighten us, we find more or less morbid implication of both sides of the cerebrum. It is when both sides of the brain are thus implicated that the mind fails to discover that something is wrong in the head, and I think we shall yet find, that conscious insanity, which we sometimes see in our asylums, is due to morbid implication of one hemisphere principally, and but slight involvement of the other, not more oftentimes, than a slightly, and temporarily disturbed circulation. The same is probably true of incipient insanity, during the initiatory stage, or "the period of incubation" as

*Dr. Malinverni, Prof. of Pathological Anatomy at Turin, gives a detailed description of the brain of a man forty years of age, who died of a gastro-enteric affection. During life he had never exhibited any deficiency or perversion of intellect, and yet after death, the corpus collosum and septum lucidum were found to be entirely absent.—*Med. and Surg. Reporter, October 24th* 1874.

authors have termed it, when the patient first begins to feel, and to say, that something is wrong with his head. We may reasonably suppose that, in this stage, the disease exists on but one side, and has not yet involved the other. The periodic or recurrent forms of insanity, are perhaps best explained, by supposing the brain to be structurally sound on one side, and disordered throughout its whole circulation only during the paroxysm of maniacal excitement.

As there are, beyond doubt, circumscribed centers of muscular movement in the cerebral cortex, as well as in that of the cerebellum, as demonstrated by the experiments of DuBois Raymond, Fritsch, Hitzig, Ferrier, Bartholow and others, so the existence of ideational and emotional centers in the hemispheres and convolutions of the cerebrum, may be believed in, as embraced in the original, but crude conception of a system of phrenology by Gall, subsequently improved by Spurzheim, and maintained by some writers on insanity as true in theory, though not in the minute details of the craniologist. This view thus far sustained, or at least uncontroverted by Hitzig, Ray, Maudsley, and others, and by the post mortem micro-photographic examinations of the brain, by Dr. Gray and others, and in many cases of ante mortem morbid cerebral phenomena, we may now accept as a true principle of mental science. Ideational and emotional centers are as reasonable, if not yet as fully demonstrable, as motor centers.

The assumed existence of duplicate ideational and emotional centers, as well as duplicate hemispheres of the cerebrum, occupying corresponding convolutions on opposite sides of the brain, enables us to frame a more satisfactory explanation of the ideational, emotional and impulsive phenomena, than could be constructed upon any other fact or supposition connected with the physiology of the brain.

The homicidal, suicidal and other insane impulses, as well as the delusions, hallucinations and illusions of the mind, doubtless have as much a local habitation as the discharging lesions of epilepsy, chorea and convulsions, or the phenomena of hemiplegia, aphasia and other forms of paralysis. Though we can not yet precisely locate aphasia, certainly not in the third left convolution of the cerebrum, as this has been destroyed without loss of speech. Dr. Wicks found the central ganglia involved in morbid lesion, in all the cases he examined,* as in hemiplegia, and we do know that the posterior lobes and convolutions are not implicated in this affection, and that the primary seat of epilepsy is in the gray matter of the hemispheres, near the *corpus striatum* as maintained by Ferrier, Hughlings Jackson, and recently confirmed by Dr. Bartholow of Cincinnati, in his experiment on the living human subject.†

If in the case first mentioned, the brain lesion had not extended to the right side in any degree whatever; if neither morbid condition of structure, or sympathetic abnormality of circulation existed; if there was no hyperæmia, no vaso-motor paralysis, in short if there was nothing to cause abnormal action in the other side of the brain, it is probable that the patient would have known that his impressions were normal, and realized that "the other" individual, which so harrassed and annoyed him, was but the creation of a disordered fancy, existing only as the result of disease, but so profound a lesion could scarcely exist in one hemisphere without implicating the other in structural lesion or morbid vascularity. There might have

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* Guy's Hosp. Rep. Vol. XII, p. 174, 1868.

† Experimental Investigations in the Functions of the Brain, by Robert Bartholow, Prof. etc., Med. Col. Ohio. *American Journal Med. Science*, April, 1874.

been very great involvement of the centrum ovale, which behaves sometimes, as Griesinger observes, under morbid involvement, "as though it had no function whatever," along with superficial and ventricular injury of the right side, and yet the man have escaped the delusion that he was two beings.

The accumulated mass of astonishing facts in connection with profound brain injury involving one side of the encephalon, and the persistence of life, with oftentimes no appreciable lesion of the intellect, leaves only this explanation by which to harmonize the facts and resultant phenomena, namely, the most complete mental power possible to an individual depends upon the integrity of the free surfaces of the cerebrum. The functions of the hemispheres are vicarious, and probably the functions of the convolutions of opposite hemispheres, just as the motor functions, are crossed. An injury of the brain may implicate both the centrum ovale and gray matter of one side, modifying mental power only in degree, but not necessarily in kind; abridging the power of mental continence, so that the mind soon becomes fatigued.

When unconscious insanity—that is insanity of which the patient is unconscious—being the ordinary form of the disease—results, both sides of the brain are involved in morbid action or change of structure. Conscious insanity is due to entire or almost entire soundness at times of one hemisphere, or corresponding convolution on the opposite side, so that enough healthy brain structure remains free from sympathetic irritation or congestive involvement on one side, and perhaps in convolutions of the affected side, to recognize the fact of deranged mental action, and to lead to attempts at self-restraint. The recent experiments in faradization of different parts of the brain are not antago-

nistic to this view, and the case of Mary Rafferty, before alluded to, experimented on and reported by Dr. Bartholow of Cincinnati, is not opposed to the position we have taken—the principal, if not the only lesion in her case involving the substance of her brain, was probably in the left side. The post mortem revealed "a thick layer of yellowish white exudation, overlying left posterior lobe, and extending downward on the left side of the falx. There were no products of this kind on the right side. Mary was rather feeble-minded, but returned correct replies to all questions," and gave a correct history of her case.

Every man of large surgical experience has encountered one or more such cases, in which recovery has taken place, without mental aberration, when he anticipated nothing else but the death of his patient.

When we see these cases in the lunatic asylums, as we not infrequently do, after years have passed by, since the reception of the injury, and complete recovery from all the immediate consequences has taken place, the insanity results usually from a hyperæmia or disturbed state of the cerebral circulation, due to the injury only as a predisposing cause, and dependent upon cerebral irritation from some other source as exciting cause of the deranged mental action. Intemperance in alcoholic beverages, opium, tobacco and other agencies which unfavorably influence the heart's action, and disturb the circulation—and moderation is sometimes intemperate excess in these cases—the poison of constitutional syphilis, malarial and contagious fevers, the intemperate use of anæsthetics, intense mental strain of immoderate ambition, and the reaction of disappointment in love, politics, business or the professions, often prove too much for a brain, which like any other, once seriously injured vital organ, should be somewhat favored in after life.

The mind of the patient carries the fractured limb in the splints of caution, long after the surgeon has removed the appliances of his art, but the man who has received a mental wound, which may have healed, but left forever a cerebral scar, oftimes forgets the nature of his injury, and attempts feats of mind which put the brain in a fit condition for the engendering of insanity, even when exempt from traumatic predisposition or hereditary tendency.

When a man has once been *hors du combat* in the battle of life from a brain injury, either so as to have to go to an insane asylum, or so as to have to undergo rest and seclusion and medical treatment for a time, he should re-enter upon the duties of life, bearing in mind, that he has not the full power of resistance to the invasion of cerebral disease, which he might otherwise possess. His mind may be restored, but its continual preservation requires more care and prudence on his part, than if he had never been so unfortunate as to have been injured. He will pay the penalty of folly and violation of nature's physical or moral laws in disordered mind, sooner than his more fortunate fellow.

These injuries augment the chances in favor of insanity in case of cerebral hyperæmia from any cause, as we have said, and are sometimes the beginning of obscure chronic lesions ending in mental derangement, but they do not compromise mentality at the time, so long as the cerebral circulation is maintained in equilibrium throughout the brain, and one side remains perfectly sound. Like hernia, the patient by exercising proper care, may go to the grave with it, and be none the worse through life, for having received the injury. Very many such persons never die of either epilepsy, insanity, or apoplexy, though they sometimes consult us for fullness in the head and apoplectic threatenings.

In these cases, as a great American Surgeon (Gross) truly says, "the mind is not necessarily affected.' Large quantities of cerebral substance, as he and others have observed may be lost, and yet the patient make a most excellent recovery. And this is the experience of an humble observer, but one no less confident that he utters a fact of experience.*

Read before the Association of Medical Superintendents of American Institutions for the Insane, at the annual meeting, held in Auburn, May, 1875.

ADDENDA.—The following interesting case, furnished by Dr. Landor, of the London, Ontario, Asylum, since the paper was read, is deemed of sufficient value to have a place here. The writer would be glad to have histories of other similar cases.

LONDON, ONTARIO, JULY 8th.

MY DEAR HUGHES:

On taxing my memory for particulars of the duality case I had under my care, I find that it was in 1850, I first saw the patient, who was a gentleman about 35 years old. He would carry on conversation with an imaginary person inside him, but only one branch of the conversation was spoken aloud. The answers of the double were never uttered, but their tenor could be imagined by the increasing anger and vehemence he exhibited; while the foulest language, and abuse were uttered and addressed to the double, in the second person. I interfered to pacify him often, but it was curious to see that no effect was produced, because he always insisted that I did not and could not hear the insults he suffered under. The quarrel always ended in blows delivered with the full swing of his right arm on to his left face, eye, and nose. "There sir, take that," what "you wont hold your tongue, there's more for you," until the blood streamed down his face, and his

* The cases of unilateral wounds collected, were omitted to abbreviate the paper, and because many of them are familiar to the reader. For the same reason some of Wigan's cases, cited by him to establish his theory of the duality of the *mind* are left out.—C. H. H.

tears ran over with the pain. After the lapse of four or five years this mode of punishing himself ceased, but the conversations did not. I suppose he had either hushed the double into order, or found out that he got the worst of it. He became a very dirty patient, but always insisted that he was a clean and polished gentleman, and that the fellow inside was a dirty, uncultivated beast. He became such a nuisance to the other patients that I requested his relations to remove him elsewhere, and so lost sight of him. It is so long since he was under my care that I can not remember more, nor any thing of his symptoms, such as pulse, eye, or other physical signs. Only the peculiarities are impressed on my memory.

I am of opinion that cases of disorded mind like the above are hardly fair cases of duality. If there were on record any cases where the two veins of thought went on simultaneously and tried each to command the organ of utterance, thrusting each other out of the use of that organ, or cases of confusion of thought such as we see in insanity and that the confusion could be traced to the operation of both hemispheres which had lost the control of the will to guide the predominant hemisphere and silence the other; here I think there would be proof of duality, each hemisphere persuing its independent course of thought. Can ordinary insanity, where the patient wanders from one subject to the other, be produced by any such disorder of both hemispheres and want of will power to guide them? If you can fix any facts, coupled with post mortem changes, then you will do much to produce conviction.

I am yours truly,

HENRY LANDOR.